LED 155
LED Navigation Lantern

User Manual
Rev 1.42 (LEDFlasher)
19.1.2005

DOCUMENT REVISION HISTORY

Revision	Date	Comments	Made By
1.41	January 19th, 2005	Default cable type changed, some other minor changes	LBM
1.41	March 22nd, 2004	Luminous intensity values updated	LBM
1.40	December 9th, 2003	Updated to LEDFlasher	LBM
1.31	October 10th, 2002	Updated revision	LBM
1.00	June 6th, 2002	Initial document	LBM

CONTENT

1 GENERAL

The LED 155 lantern is a new LED replacement for the standard 85mm and 155mm marine lanterns. The design is characterized with high efficiency, mechanically robustness and compatibility with signal standards.

LED 155 is designed upon the Finnish MPV-3/LED lantern, which is capable of handling the ice pressure conditions in the Baltic Sea region – without additional ice protection. Whereby the new lantern is very sturdy and will endure considerable impact before destroyed.

The lantern can be delivered with up to three optical heads (lenses and LED rings):

| Standard | Duplex | Triplex |

The Input voltage range for the lantern is 9 to 28 volts DC, and the intensity will remain constant within the input voltage range. This enables nominal light output at a 3 volt lower input voltage compared to standard 12 V marine lamps, which starts reducing intensity as soon as the input voltage drops below 12 volt.

The lantern is supplied with a standard 4 wire cable (3+1). The wires are permanently marked with the following labels; B+ (Battery Positive), B- (Battery Negative), PV- and PE. The PV- signal is the negative signal from the solar panels. Wiring diagram is attached to the end of this document.

2 Delivery Configuration

There are a number of options available for the lantern. When ordering, it is recommended that it is clearly indicated in the order the lantern configuration.

2.1   Lantern Base

The lantern can be supplied with two types of bases;
   3 holes equally distributed a 150mm diameter (for 85mm lantern replacement)
   4 holes equally distributed a 200mm diameter (for 155mm lantern replacement)

2.2   Lantern Controller

The default controller is the SmartFlasher for LED's (also called the LEDFlasher). This is a new controller replacing the previous standard SmartFlasher and LEDDriver which has been the standard controller in previous LED lanterns. When ordering the lantern with the SmartFlasher the LED 155 User Manual 1.31 applies.

2.3   GPS Sync Unit

For synchronizing lanterns using GPS signal, a GPS Sync Unit is available for the lantern. The GPS receiver is installed inside the lantern body and the GPS antenna is installed on the top of the LED 155 lantern hat. For more information about the GPS Sync Unit, please refer to the unit's own manual. The GPS option is only available with the LEDFlasher.

2.4   Cable Options

The lantern is supplied with a 1,5 meter 3 + 1 wire PUR cable as standard. Upon request, the lantern can also be supplied with a 3+1 polarity quick connector produced by Schaltbau. The details of this connector are:

Type: Schaltbau M14 black with cover M1D black
              M1E-4P+PE (4-pin + PE)
              4 x Pin: 1,58C 1,5 Au (or Ag)
              1 x Receptacle: CB 1,58C 1,5 Au (or Ag)

Pin Order: U+ on Pin 1, Ground on Pin 2, Sync Out on Pin 3
              Lantern ground on Receptacle PE

A corresponding supply cable with the matching Schaltbau termination is also available (has to be ordered separately).

2.5   GSM Remote Monitoring

The lantern can be supplied with a built-in SmartLink Remote Terminal Unit (RTU) with integrated GSM modem. Only GSM SIM card needs to be added to enable the lantern to be a fully featured remote monitoring that can send status reports to end user or/and WebSCADA using GSM Short Message Service (SMS).

The option is only available with the LEDFlasher.

2.6   Optical Feedback System (OFBS)

The lantern can be supplied with an integrated OFBS unit that enables optical feedback monitoring of the LED's. If the LED intensity degrades when the LED's are aging, the OFBS system will be able to detect this and report back the level of degradation. Also, if the LED's fails in one sector, the OFBS system will note this and report back to flasher.

The OFBS unit is a standalone microcontroller unit with integrated firmware. At the end of the assembly of the lantern, each lantern is calibrated at the factory. As a part of the calibration procedure the starting value for each optical sensor is stored individually in the OFBS unit memory. When flashing night time the OFBS feedback level is reported back to flasher continuously. When operator wants to check the intensity level of the LED's he can then access the reading from the lantern by Programmer. The LED actual level is reported back in the lantern Status list as a percentage of original (100%).

2.7   Standard or Wide Lens

The lantern can be supplied with two different vertical divergences, standard or wide. The standard lens is used on lantern for fixed locations and on buoys with reasonable high stability and with less current. The wide lens is designed for usage on all floating stations in high current locations.

The nominal vertical divergences for the lenses are listed in the table below.

Lens	Divergence @ 50% of peak Intensity	Divergence @ 10% of peak Intensity
Standard	6°	10°
Wide	10°	20°

The maximum luminous intensity and power consumption for each optical head (tier) of the lantern is:

Standard Lens	Luminous Intensity and max Power Consumption		
Colour	Standard	Duplex	Triplex
Green	120 cd @ 6W	240 cd @ 12W	360 cd @18W
Red	120 cd @ 6W	240 cd @ 12W	360 cd @18W
White	100 cd @ 6W	200 cd @ 12W	300 cd @18W
Yellow	90 cd @ 6W	180 cd @ 12W	270 cd @18W

Wide Lens	Luminous Intensity and max Power Consumption		
Colour	Standard	Duplex	Triplex
Green	90 cd @ 6W	180 cd @ 12W	270 cd @18W
Red	80 cd @ 6W	160 cd @ 12W	240 cd @18W
White	80 cd @ 6W	160 cd @ 12W	240 cd @18W
Yellow	70 cd @ 6W	140 cd @ 12W	210 cd @18W

The optical lens is made in Lexan™ polycarbonate and enables a vertical divergence which is equal to or higher than the standard 85mm lenses, and much higher than the existing 155 lanterns.
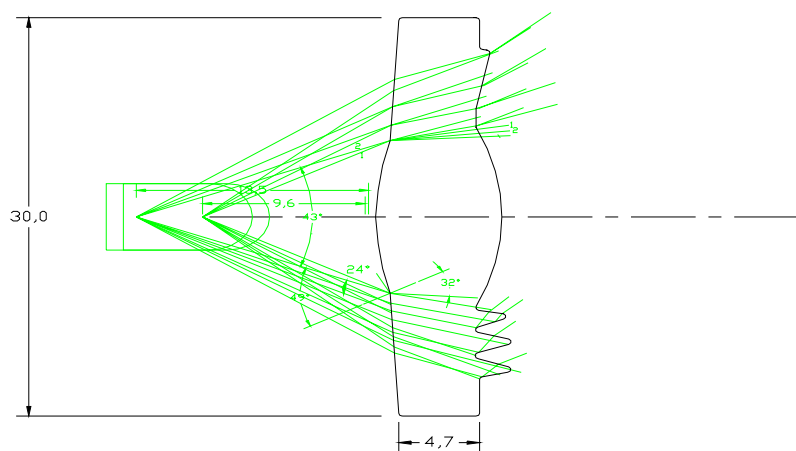
In addition to this, the lens has light emission from the edges of the lens which is distributed evenly upwards – thus enabling the lantern to have the capability of being observed from high ships passing close to the lantern.

3 LANTERN DESIGN
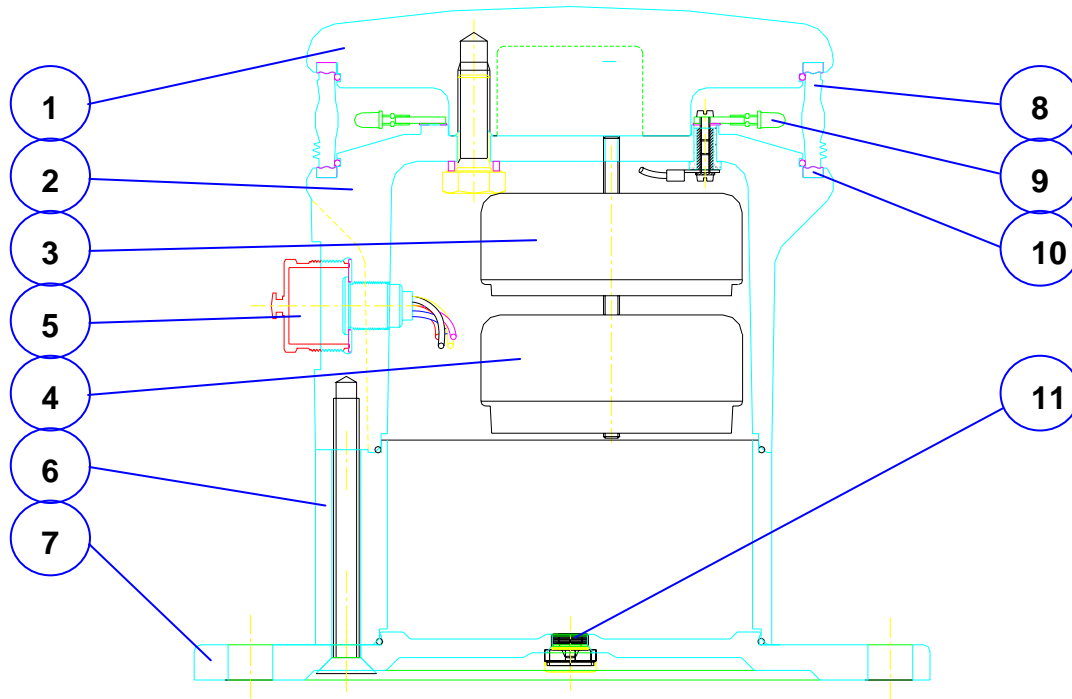
The lantern consists of:

Part	Description	Note
1	Top cover in aluminium	Mounting of bird spikes
2	Lantern Body aluminium	
3	LEDFlasher	
4	Optional Unit (GPS Synchro or SmartLink GSM)	
5	Data Connector to flasher c/w cover	Optional IrDA unit
6	Optional Extemsion Unit	Encreases focal height
7	Lantern base in aluminium	
8	Fresnel Lens	Polycarbonate Lexan
9	LED ring	Including photocell
10	Lens Gasket (2 pcs)	
11	Lantern venting (Gore PTFE membrane)	

Other design features/details:
- Top cover is mounted with 6 pcs 10mm bolts
- Lens centering is by dual O-ring gaskets
- LED-PCB is connected to heat sink using special thermal film (GAP-PAD)
- The color code of the lantern can be found on the top blind plug

The exact number of LED's varies depending on color.

The lantern has a built-in photocell which also is located on part 3 (the LED printed circuit board) inside the lens. When testing the photocell operation, it is important to cover the entire lens for example with a carton box in order to completely black out the photocell.

There is a software controlled delay of approximately 30 seconds in the lantern before it switches from daytime mode to night operation, meanwhile the cover should not be removed (otherwise the lantern resets the delay counter)

4 SETTING POWER AND INTENSITY

The lantern intensity can be adjusted from default 100% intensity down to 15% intensities by means of serial communication.

The default factory setting is 100 % intensity. If a lower intensity is required, the intensity should be adjusted by means of programming the lantern. The control of the intensity is by means of Pulse Width Modulation (PWM) and the LED's are always supplied with a nominal current that is 750 mA per tier. The LED nominal current should not be altered by the user (only available in Programmer Mk2 advanced mode) as a mean of adjusting the intensity; instead the Intensity setting should be altered.

In the table below, you can find the various standard settings and the corresponding LEDFlasher Intensity set value required for the LED intensity:

White	Power [W]	Standard Lens Intensity [cd]	Wide Lens Intensity [cd]
Maximum	6,4W	125	80
	5W	100	64
	4W	80	51
	3W	60	38
	2W	39	25

Green	Power [W]	Standard Lens Intensity [cd]	Wide Lens Intensity [cd]
Maximum	6W	138	90
	5W	116	87
	4W	93	69
	3W	70	52
	2W	46	34

Red	Power [W]	Standard Lens Intensity [cd]	Wide Lens Intensity [cd]
Maximum	6,6W	122	80
	6W	111	73
	5W	94	63
	4W	76	51
	3W	58	38
	2W	37	25

Yellow	Power [W]	Standard Lens Intensity [cd]	Wide Lens Intensity [cd]
Maximum	6,6W	90	70
	6W	82	63
	5W	69	54
	4W	56	44
	3W	42	32
	2W	27	22

5 PROGRAMMABLE SETTINGS OF LANTERN

The lantern functions are controlled by the LEDFlasher intelligent flasher unit that also incorporates a built-in solar panel charger allowing for up to 100W's of solar panels to be connected directly to the lantern.

Configuration of flasher is by means of serial communication to the flasher. The serial port of the flasher is located under the green cap between the two cable glands (or quick connectors depending on lantern versions).

Data connector

For configuration, the PC-Interface software (ProgLED) or the new portable Programmer Mk 2 unit can be used. For further details about using these configuration tools, refer to the appropriate instruction manuals for these devices.

NOTE: The LEDFlasher ONLY works with the new Programmer Mk 2 portable unit. The old Programmer is NOT compatible with the new LEDFlasher.

By default, the Programmer Mk 2 only displays the standard settings in the lantern that needs to be set prior to installation.

5.1 Setting up lantern, Normal Mode

When the Programmer Mk 2 is connected to the lantern, the unit will automatically read the lantern configuration and display the settings to the user. In the default mode only the most commons settings are displayed:

Flasher functions		Default	Unit
1	Intensity	100	%
2	Photocell Threshold Level	2,5	V
3	Flashing Character	ISO 2	1+1=2s

The settings can be modified and stored back to the lantern, where they will be stored in the EEPROM of the LEDFlasher.

5.2   Lantern Advanced Settings

With the Programmer Mk 2 you can also access the advanced setting by pressing the dot-key three times. When in Advanced mode, all the LEDFlasher parameters can be modified.

The table below outlines all the settings available in the lantern:

A. Flasher functions		Default	Unit
1	Intensity	100	%
2	Synchronising offset (delay)	0	S
3	Fixed light	Off	
4	Minimum battery voltage	9	V
5	Reconnecting voltage hysteresis	1,0	V
6	Photocell threshold level	2,5	V
7	Flasher serial number	Individual	
8	Photocell override	Off	
9	Photocell override time-out	1 Day	
10	Sync Out / Error Out	Sync Out [3]	
11	Language		
12	OFBS Minimum Level	70 [2]	%
13	LED Nominal Current	0,75 [1]	A

B. Timer functions	(seasonal lights)		
1	Off period	Off	
2	Off period start date	Jan 1	
3	Off period end date	June 1	

C. PV Charger functions			
1	Cut-out voltage	14,4	V
2	Cut-in voltage (charging reconnecting voltage)	13,8	V
3	Boost charge hysteresis	0,5	V
4	Temperature compensation	30	-mV/°C

1) LED Nominal Current Setting is depending on number of tiers. For the LED 155, the default setting is 0,75 ampere per tier, and this value should not be altered.
2) OFBS = Optical FeedBack System, only applies if the OFBS sensor is installed in the lantern
3) Sync Out / Error Out = alters the function of the Sync Out + terminal on flasher. In the default mode the flasher sends a Sync pulse to the Sync Out when flashing. When configured to Error Out the Sync Out pin will act as a logical alarm output that can be connected to a third party remote monitoring system Digital Input.

6 TROUBLESHOOTING AND MAINTENANCE

The unit is designed to be maintenance free, except for battery replacement and lens cleaning. However, to maintain a good light output and long lifetime, it is advisable to go through the following list upon a service call to the lantern:

General Maintenance
- Cleaning the metal parts of the lantern and checking for any leakage
- Cleaning and checking of the lens (usage of solvents prohibited)
- Check that the light turns on/off and that the intensity appears to be normal. The photocell is located inside the optical lens so the easiest way to activate the lantern is to cover the lens and wait for a minimum of 30 seconds (the flasher has a built in delay)
- All LED's have the same intensity
- Check, and if necessary replace the bird spikes

Service Call
- Check the cables
- Check the flasher diagnostic (requires configuration device)
- Check and register the battery voltage
- Check the physical condition of the battery and replace if damaged

6.1 ERROR LED CODES (FLASHER SELF DIAGNOSTIC RED LED)

Error LED codes are initiated when there are failures in the system. The codes are flashed in order of priority since only one error code can be shown at any time.

|			
1. PROM Failure	111110	111110	two short eclipses
2. Program Failure	101010	101000	five flashes
3. EEPROM Failure	101110	101110	short flash, long flash
4. Short Circuit	110110	110000	three long flashes
5. Battery Low	100000	100000	one flash
6. Not in use	101010	000000	three flashes
7. Lamp Failure	101000	101000	two flashes

1= LED on
0= LED off

The LED flashing frequency is one second; therefore the total LED message period is 12 seconds.
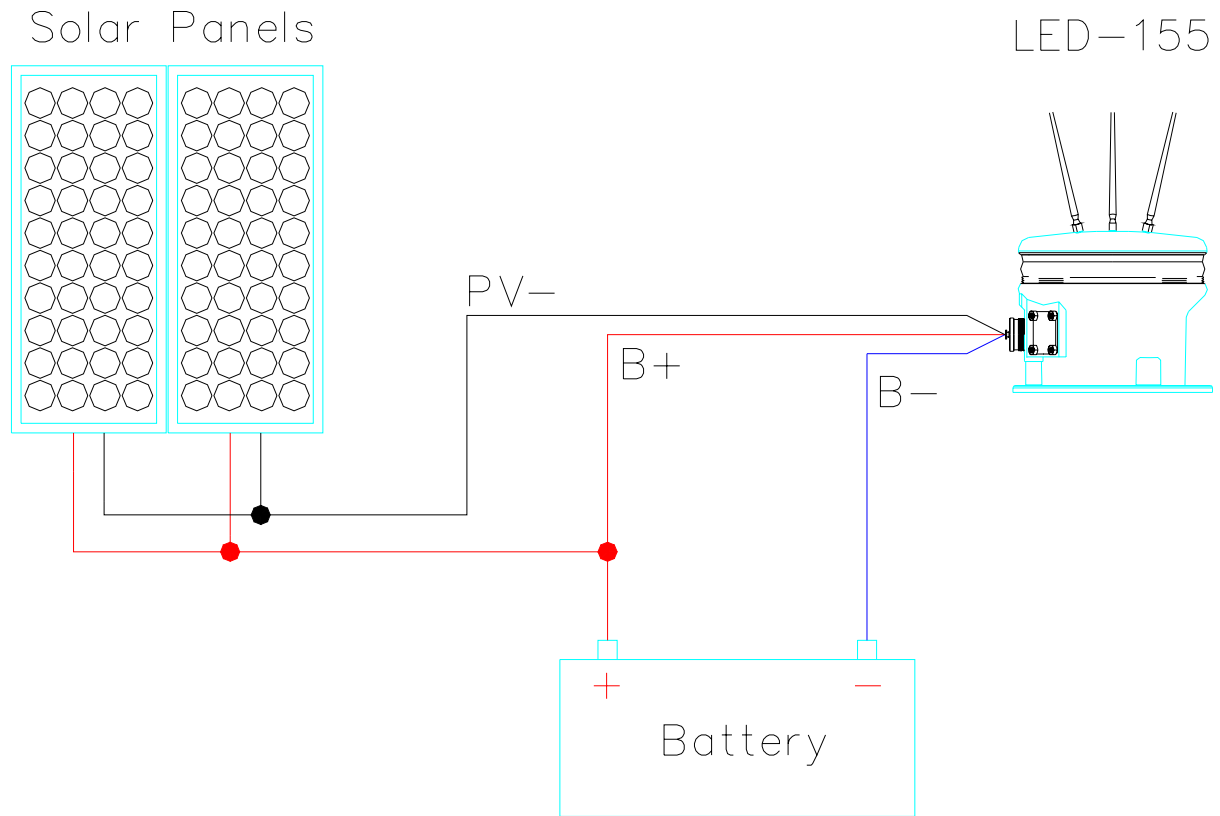
6. GENERAL LAYOUT DRAWING

140

ø170

ø150 3 X M8
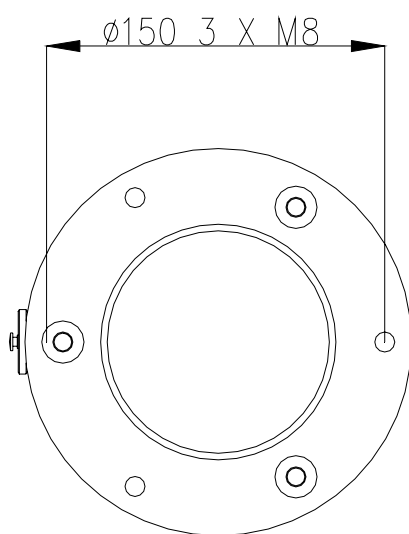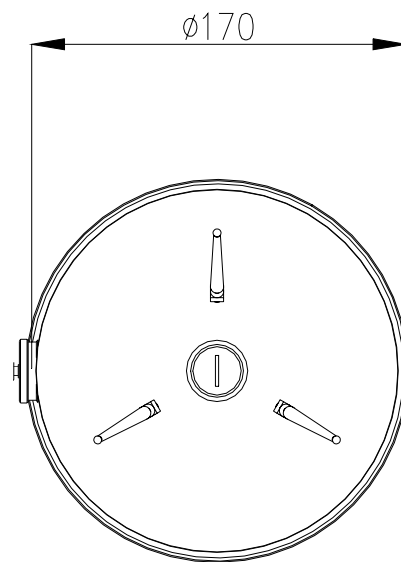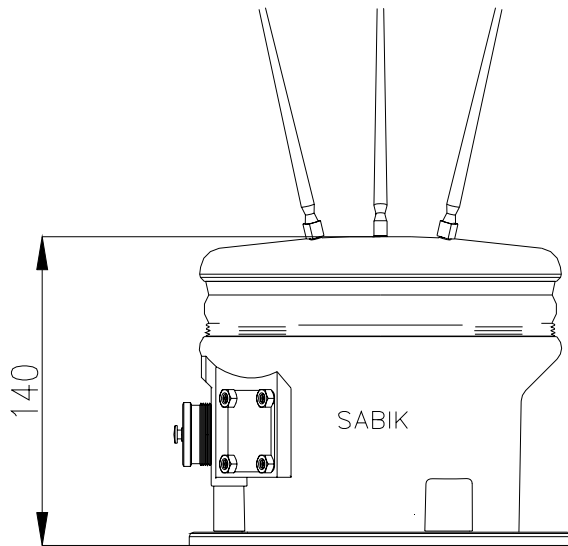
Mounting Flange; Small

SABIK

ø200 3X + 4X M12
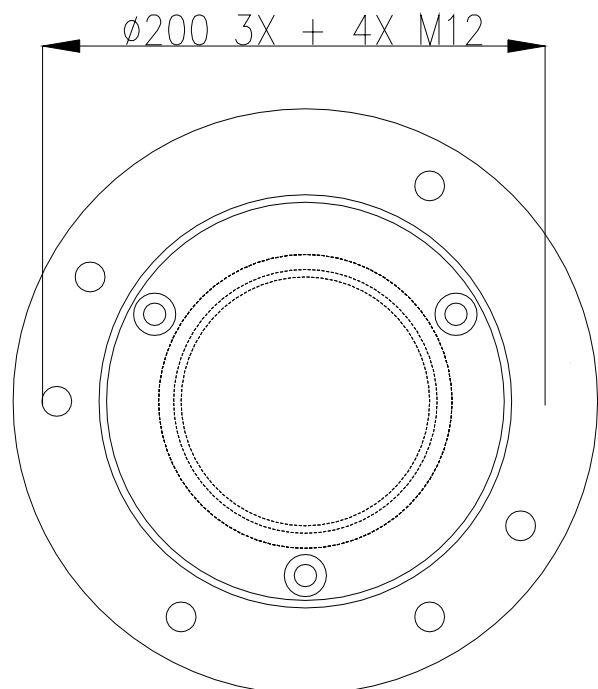
Mounting Flange; Large

WIRING DIAGRAM

Solar Panels

LED-155

PV-

B+

B-

Battery

+   −

LEDFLASHER 6-28
Configuration Parameters

A. Flasher functions		Default Value	Unit
1	Intensity	100	%
2	Synchronizing offset (delay)	0	S
3	Fixed light	Off	
4	Minimum battery voltage	9	V
5	Reconnecting voltage hysteresis	1,0	V
6	Photocell threshold level	2,5	V
7	Flasher serial number	Individual	
8	Photocell override	Off	
9	Photocell override time-out	1 Day	
10	Sync Out / Error Out	Sync Out [3]	
11	OFBS Minimum Level	70 [2]	%
12	LED Nominal Current	0,75 [1]	A

B. Timer functions	(seasonal lights)	Default Value	Unit
1	Off period	Off	
2	Off period start date	Jan 1	
3	Off period end date	June 1	

C. PV Charger functions		Default Value	Unit
1	Cut-out voltage	14,4	V
2	Cut-in voltage (charging reconnecting voltage)	13,8	V
3	Boost charge hysteresis	0,5	V
4	Temperature compensation	30	-mV/°C

LEDFLASHER

Analogue Measuring and Status

Partameter		Unit
Flasher		
1	Battery voltage (loaded)	V
2	Battery voltage (unloaded)	V
3	Lamp illumination time (counter 1)	h
4	Flasher Real Time Clock	
5	Photocell Day / Night indicator	
6	Photocell level	V
Charger		
1	Charging status	
2	Solar Panel Charging current	mA
3	Charged Ah's	Ah
4	Temperature	°C
Alarm		
1	Self Diagnostics Error Code	

Appendix C

LEDFLASHER TECHNICAL SPESIFICATIONS

FLASHER FEATURES	
Input voltage	9 .... 28 volt DC
Output Intensity Range	Programmable at steps of 1%, min 15% of full intensity
Output LED current	Max 2,0 ampere (100 % duty cycle)
Output control	PWM at 125 Hz
Standby current	less than 1,0 mA (daytime)
Flash character	Any desired light character, all IALA and any non standard. Max flashes in group 20, max. length of flash 325 seconds, min. flash length 0,10 seconds
Synchronizing	Synchronizing port standard. Automatic configuration to Master or Slave. Running light, flip-flop or other special settings available
Time accuracy	± 0,01 %
Connection terminals	11 pieces screw terminals, silver coated brass
Galvanic insulation	> 2 Mohm to case
Protection	Protected against reverse polarity and short circuit
Programming	All parameters user programmable.
Programmable settings	19 pieces
Monitoring	Built-in. Data transferred by serial communication
Monitorable measurements	12 values, analogue and status indicators
Programming devices	PC-computer or Field Programmer Mk2
Error signal	Flashing indicator red LED, 7 different codes
Charging signal	Green indicator LED, turns on when solar panel circuit in operation
Photocell	Built-In or external. Programmable in 50 steps from 10 to 1.000 lux
Solar Regulator	max 8 ampere
Ampere hour counter	± 5 % accuracy
Temperature sensor	Built-in. Accuracy ± 2 °C
Serial communication	4800 baud asynchronous
Processor	8 - bit, 4 MHz controller
Temperature range	- 40 °C ... + 60 °C
Design features	Fully enclosed. Galvanic insulated shell of black anodized aluminum
Dimensions	36 mm x Ø 82 mm, weight 340 g
Firmware	On FLASH ROM. Can be upgraded via serial communication